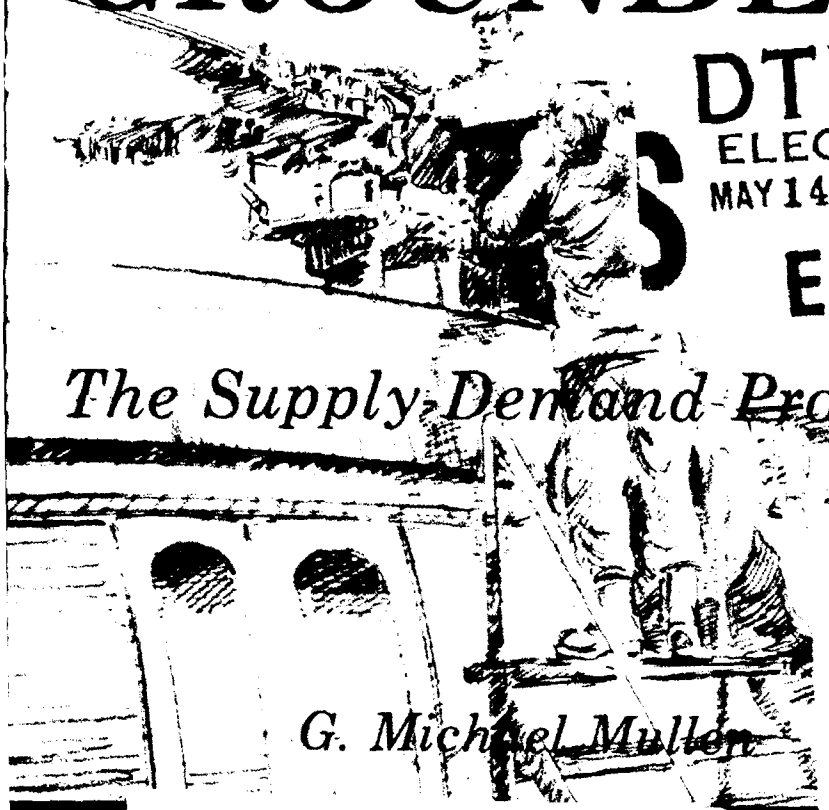
CHOPPERS GROUNDED:

The Supply-Demand Problem



G. Michael Mullen

A National Security Essay

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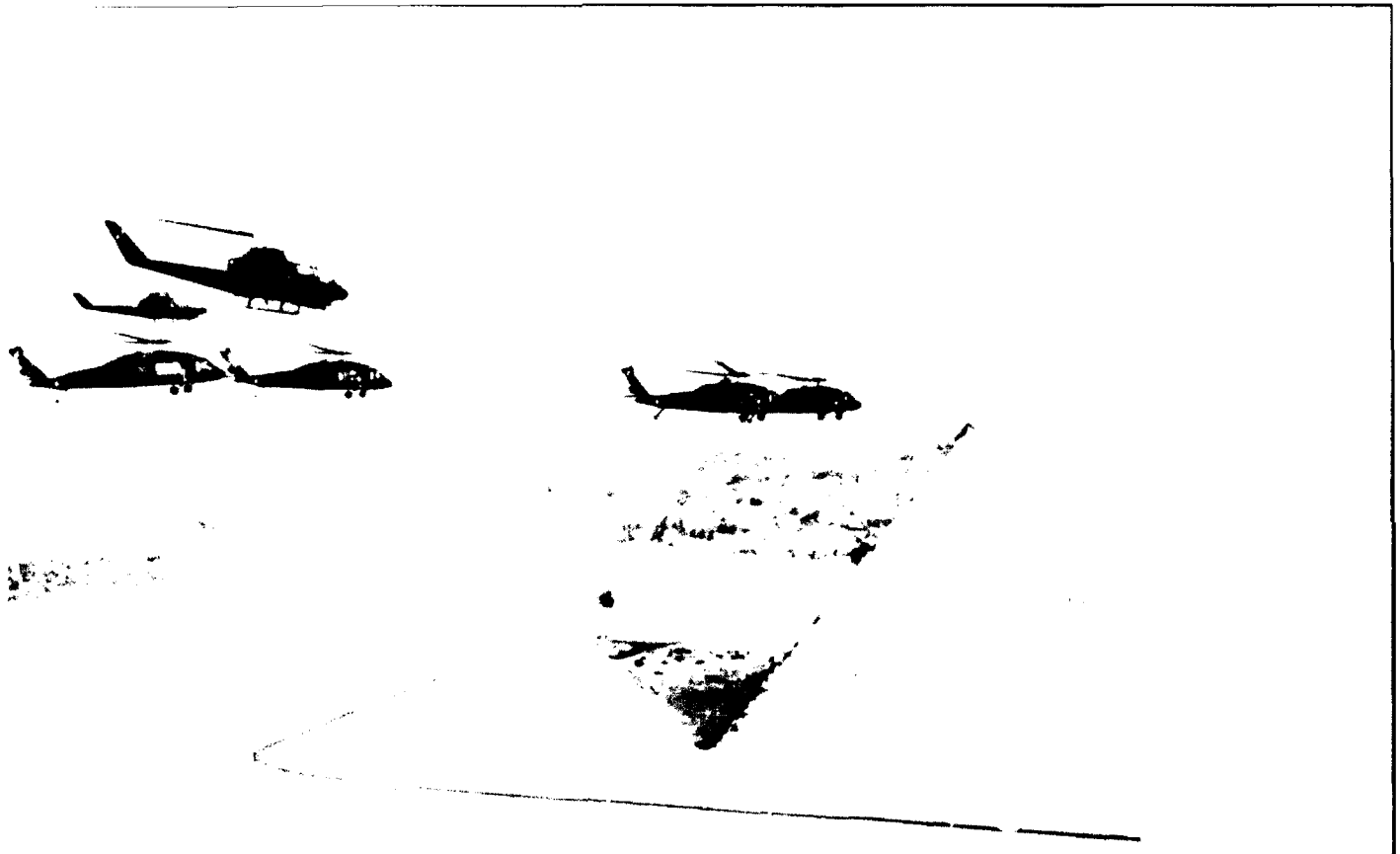

Black Hawk and Cobra helicopters maneuver near the Egyptian Pyramids during Exercise Bright Star in 1982.

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To my family: Sandy, Leslie Anne, and Mike

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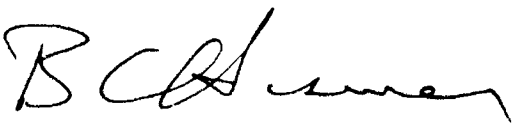
Foreword

Believing that an adequate supply base is often the key to combat success, Colonel G. Michael Mullen focuses in this essay on the availability of a single, high-technology weapon system—the UH-60 utility helicopter. In an opening scenario depicting a war in Europe in the 1990s, he shows how shortages of this helicopter might conceivably occur—and the severe consequences such shortages might mean for the overall warfighting effort.

Colonel Mullen argues that current production figures for this helicopter are too low, and that US industrial capability to produce additional aircraft will be insufficient to meet wartime demands. The repair and maintenance needs of these sophisticated machines will be aggravated by combat attrition. The helicopter shortage will be especially damaging because three Services have adopted the highly versatile UH-60 to perform various critical missions. The largest user, the Army, has integrated helicopter support into virtually all its tactical planning; the Navy uses it to protect the fleet against enemy submarines; and the Air Force uses the UH-60 for search and rescue. The author argues further that additional wartime demand will come from our Allies, who will want their own UH-60s or will request US helicopter support missions—a demand for which the United States has not adequately planned. To meet such demands, the author proposes ways to increase inventories, readiness, and industrial production capability. The answer involves far more than just money. It requires careful planning because increased industrial "surge" depends on adequate facilities, tooling, and skilled manpower—none of which can be created overnight.

The author makes a strong case for increasing helicopter supply, but the remedies he suggests also apply to other vital, high-technology weapon systems. Because we can't afford to have our helicopters or planes grounded, our tanks immobilized, our soldiers stranded, or our ships dead in the water, this essay is recommended reading for military planners.



Bradley C. Hosmer
Lieutenant General, US Air Force
President, National Defense University

Preface

> What I want to avoid is that my supplies should command me.
>
> Comte de Guibert
> *Essai General de la Tactique*, 1770

Sustainability in combat has long been recognized as the chief problem for North Atlantic Treaty Organization (NATO) forces facing an attack by Soviet forces. Reviews of numerous NATO exercises have been unanimous in citing the gravity of the problem with sustainability. As one senior Department of Defense (DOD) official put it in 1978, after viewing a major exercise called *Nifty Nugget*, "The Army was simply attrited to death."[1]

The major lesson of *Nifty Nugget* was that the United States is unable to sustain its forces in combat. The fact that the United States is behind in its true warfighting capability remains a national issue—mainly because the United States cannot produce the materiel needed to sustain a major conventional war.

The bleak conclusions of *Nifty Nugget* and two ensuing national mobilization exercises underscore the grave problem of how the United States will supply its forces during a major conflict. In its planning, the United States characteristically views future conflict as a United States versus the Soviet Union fight. War planning, although incorporating the military contribution of NATO Allies, often

neglects to consider the materiel needed by many Allies to conduct combat operations in a global war. Furthermore, as the *Nifty Nugget* exercise showed, the United States has failed to provide for the support of its own forces even as it has failed to plan for major equipment items and supplies needed by Allies. Any major future conflict will make extraordinary demands on the US industrial base, which already is insufficiently prepared for mobilization.

This essay reviews overall US preparedness to meet its security requirements by focusing on the capability to produce and support just one single weapon system, the utility helicopter H-60 in its three Service derivatives: the Army's UH-60A "Black Hawk," the Navy's SH-60B "Seahawk," and the Air Force's HH-60D "Nighthawk."

Although addressing a single weapon system makes other equipment generalizations difficult, what is significant is to recognize the extent of the problem with just one system—the very important utility helicopter, used for so many vital missions by all the Services. We must recognize the fact that solutions do exist, and that the alternative to solving the war sustainment problem is to accept the unacceptable—that US military forces will be denied the equipment they need to fight.

Acknowledgments

This essay would not have been possible without the efforts of many. I am grateful to the faculty and my fellow students at the Industrial College of the Armed Forces who helped clarify the issues, to the senior research fellows at the National Defense University who made me clarify my writing, and to Mr. Gary F. Rast of the Sikorsky Aircraft Division of United Technology Corporation for his expertise and insights.

My special thanks to Dr. Fred Kiley for his extraordinary tenacity, and Mr. Ed Seneff for his superb editorial efforts.

And as in all things– thanks, Sandy.

CHOPPERS GROUNDED

The Supply-Demand Problem

A European War Scenario for the 1990s

THE US ARMY IN EUROPE has long been comfortable with using helicopters in close combat. Despite its vulnerability to enemy fire and inability to be fully effective under conditions of reduced visibility, the helicopter is indispensable to Army leaders of the 1990s.

At the onset of conventional war in Central Europe, NATO forces are more effective than anticipated by prewar planners—they hold their own against probing, wide-front, initial Soviet assaults. Attrition of men and materiel is high. The Allied Forces Central Region Commander requests and receives approval to accelerate movement of critical combat items from US-based reinforcing units. Among these supplies are UH-60 Black Hawk utility helicopters and flight crews. These crews and aircraft come from the most ready unit, the 101st Airborne Division (Air Assault).

Months before, as international tensions rose, the Sikorsky Aircraft Company received contracts to double helicopter production rates on the last existing contracts and to meet anticipated demands of the war in Europe. The manufacturer, with plans already in-place to increase production, immediately places orders with its subcontractors. Unfortunately, the peacetime manufacturing process to produce helicopters takes more than two years, and the United States historically has taken two years to tool up additional production of complete

weapon systems. Only those helicopters in the pre-war funded production line can be accelerated. The war could be over before the first reinforcing UH-60s arrive in Europe.

At the onset of hostilities by Warsaw Pact nations in Europe, US Allies and other Free World countries see the danger to security, and immediately initiate plans for mobilization. The long-delayed worldwide provisioning for adequate defense results in an overwhelming demand for sophisticated weapon systems from the United States, the country with weapon systems available to meet the immediate needs for self-defense. The United States is tied to these countries through long-standing security arrangements and treaties. These agreements do not specify logistical and materiel support, but do attest to mutual concerns for the security of treaty nations.

The United States needs the support of well-equipped allied armed forces and the Allies need the support of the United States in their mobilization efforts. The level of threat determines the most pressing need. In the case of Japan, the least prepared of the Pacific powers, the immediate threat during a European war is Soviet submarine interdiction of Japanese sea lifelines. Japan's ambassador to the United States meets with the American Secretaries of State and Defense during the initial weeks of the European war to demand weapons, including antisubmarine helicopters, which he sees as absolutely essential if Japan is to protect its internal and external sea lanes.[1]

For its part, Japan will attempt to contain the Soviet Pacific fleet but the Japanese representative also requests additional artillery, vehicles, air

defense weapons,[4] and Black Hawk helicopters for its ground forces.

After heated debate within the DOD and the State Department, both Secretaries recommend to the President that the United States honor its moral obligations to Japan and provide the high-technology systems demanded.[5] Forty SH-60B LAMPS (Light Airborne Multipurpose System) III antisubmarine helicopters and 25 H-60A Black Hawk utility helicopters are shipped to Japan, along with other equipment required to strengthen its defense forces.

To meet the needs of the US Navy, the Secretary of Defense gives priority to the production of Seahawk helicopters. Sikorsky's production facilities cannot immediately meet the increase. On the authorization of the Secretary of Defense, Sikorsky devotes its entire resources to the production of Seahawks. Parts and components needed for the Seahawks are taken from the Army's primary utility helicopters still on the production line. Production of Army Black Hawks is stopped, awaiting critical parts. Additional Army helicopters become "not-mission-capable" because of parts shortages.[6]

Without a full complement of Black Hawks, commanders in the European Theater soon feel constraints on their operations. The tempo of US ground operations noticeably slows as the reluctance to use an irreplacable weapon system permeates the command.

The Soviets, noticing the hesitation in US ground mobility, press their newly found advantage; they attack the weakened NATO units—all are without sufficient replacements to cover combat attrition.

* * * *

In this scenario, US demands for equipment could not be met. Additional demands from underdefended Allies resulted in multiplying the demand that, when filled, sealed the fate of the US Army in Europe. The results predicted by mobilization exercises in the late 1970s and early 1980s were validated in the 1990s.

1.
Demand for Helicopters

IN THE PRECEDING SCENARIO, the utility helicopter played a critical role; the helicopter is one of many high-technology devices the Armed Forces depend on. The unique vertical takeoff, landing, and hover capabilities of the helicopter give great tactical mobility to the military commander, because the aircraft is not constrained by terrain. The United States is the Free World's primary user of military helicopters, with more than 8,000 in the Army, 400 in the Navy, and some 300 in the Air Force. The helicopter proved to be a significant force multiplier in combat during the Korean and Vietnam wars. Its special capabilities make it indispensable for certain missions; without an available helicopter, the mission usually isn't undertaken.

Helicopters, however, are expensive high-technology weapon systems that are not purchased in the same relative numbers by other armed forces of the Free World. Japan's self-defense forces, for example, have a total of 545 helicopters of nine different types.[7]

Only the Soviets have put aside affordability to maintain a larger fleet of combat helicopters. The national priorities of most countries currently do not allow for the purchase of helicopters to meet modern military requirements. And, in the case of many nations, only small purchases of any defense items are allowed. But a pent-up demand still remains for these machines, and this demand will be

realized when the national security of these nations is threatened.

The demand for H-60s will be considered from the view of our own forces. Potential demand by our Allies for H-60 helicopters is difficult to define. But since the H-60 fills a critical need for the US military, an additional demand is likely for this important weapon system to meet the need for tactical mobility. The needs of US Allies cannot be met from available inventories, and will add an additional load to our already overloaded supply system. This conflict in supply and demand will have a significant impact on US Armed Forces.

US Forces' Demand for Helicopters

The greatest user of helicopters in the US Armed Forces is the Army. The rapid tactical movement of men and supplies by helicopters has become the norm. Helicopters have a significant influence on the maneuver doctrine of the US Army, and this support is an integral part in the planning and execution of all tactical operations.

Black Hawks meet the need for increased performance and battlefield survivability. The aircraft is capable of performing its mission anywhere in the world, even in the previously prohibited mountainous areas of hot Southwestern Asia. Essentially a utility helicopter—a performer of tactical troop lift and front-line logistical missions—the Black Hawk also has been purchased by the US Army for special electronic warfare missions. The Army is planning to phase out approximately 1,300 vintage 1960 UH-1s, and replace them with UH-60As.

A number of special-mission Black Hawk derivatives also are being produced. Production of the Black Hawk is expected to extend into the 1990s.

Needing a complementary LAMPS (Light Airborne Multipurpose System) helicopter to extend the range of antisubmarine operations, the Navy selected the Sikorsky Helicopter Company as airframe contractor for its LAMPS III helicopter. In the 1960s, the developing technology in submarine detection allowed the Navy to think of extending antisubmarine warfare (ASW) beyond the immediate vicinity of a destroyer. Projecting defenses 100 miles forward of the fleet has greatly increased the effectiveness of detecting and identifying enemy submarines. Working as a team with a destroyer, the Seahawk greatly enhances the fleet's ASW effort. Controlled by the destroyer's combat information center, the Seahawk is a highly responsive total weapon system that detects enemy submarines at distances that exceed the enemy's ability to effectively engage US forces.[8]

The need to replace the aging Sikorsky SH-3 antisubmarine helicopter has generated additional demand for SH-60B Seahawks. The new aircraft (the SH-60F) would be used for close-in fleet protection by equipping this version with a dipping sonar. The integration of surface and airborne ASW operations has produced one of the world's most effective counter-submarine weapons.

Also creating a demand for essentially the same airframe as the Army's Black Hawk is the combat search-and-rescue (SAR) mission of the US Air Force. With specially designed equipment, the Air Force's HH-60D Nighthawk will be fully capable for low-altitude, adverse-weather operations. A navigation system, plus terrain-following avoidance radar

and additional fuel capacity, will increase the performance of this special derivative of the Black Hawk.[9]

The SAR mission is critical to air combat operations, as requirements for sustained tactical fighter support operations demand a rapid recovery of downed air crews. The Nighthawk will replace the Air Force's aging combat SAR helicopter fleet with unique capabilities that make possible rescue missions into the most hostile weather and enemy antiaircraft environments—missions that previously could not be flown without unacceptable losses.

The US Armed Forces established a 1985 demand for 1,775 UH-60A Black Hawk, 204 SH-60B Seahawk, and 243 HH-60D Nighthawk helicopters. These numbers represent only budget-constrained requirements to outfit the currently planned force, the force that is the nation's commitment to initial combat. Not all these aircraft would be committed to combat, but they would be needed to accomplish the overall mission. (The general breakdown is shown in table 1.) Force requirements include aircraft designated to meet operational, training, replacement, and maintenance needs.[10]

Demands of Allies for Helicopters

While allocating resources to supply US forces with H-60 helicopters, the United States is ill-prepared to help its Allies in a global mobilization. In fact, this aid was not considered. The concern a nation has for its defense and its perception of the level of threat to its freedom and security are reflected in the amount of that nation's resources allocated to defense. The United States has

Table 1
Service allocation of H-60 assets

	Number of H-60 Helicopters		
Type	**Combat Units**	**Other Units**	**Totals**
UH-60	1,491	284	1,775
SH-60B	150	54	204
HH-60	202	41	243
Total	**1,843**	**379**	**2,222**

Note: Numbers are estimates of helicopters that will be committed to combat or be available for replacement for combat losses because they are supporting critical missions, such as training.

established its concern at a spending level of about 6 percent of its gross national product (GNP). Other NATO countries spend less, about 4 percent; Australia and New Zealand spend about 3 percent; and Japan trails all industrialized nations with 1.6 percent of its GNP allocated for defense.[11]

Countries more directly threatened by the Soviet Union spend more for defense. For example, the People's Republic of China spends 9 percent and the Republic of Korea spends 9 percent. As the threat of war increases, nations tend to greatly increase their defense expenditures, historically to levels exceeding 30 percent of GNP. Shortly before World War II (1934-38), for example, expenditures for armaments doubled, tripled, and, in the cases of Germany and Japan, even quadrupled.[12] Before 1934, the average levels of spending of these nations were less than 5 percent of GNP.

As the threat becomes more real, demand for armaments grows stronger, as reflected in percentage of GNP spent for defense by countries that are, in fact, prepared for war. The countries of Southwestern Asia are just one example: They are spending nearly 17 percent of their GNP for defense. Israel and Syria are spending more than 20 percent of their GNP for defense, while Egypt and Saudi Arabia are spending in excess of 10 percent. Using a level of defense spending equal to 6 percent of GNP as a prudent level of concern for security, in response to a Soviet annual expenditure exceeding 12 percent, relative levels of potential demand for defense equipment of certain countries are shown in figure 1.

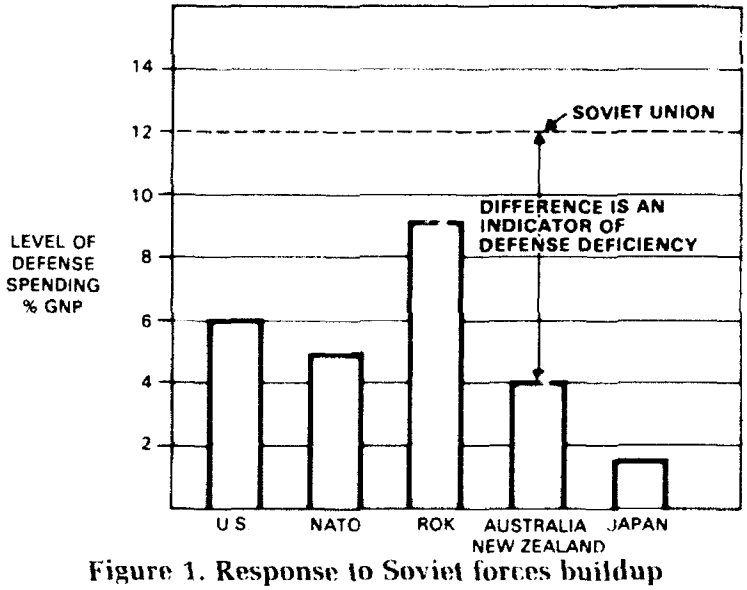


Figure 1. Response to Soviet forces buildup during the early 1980s

Source: The Military Balance 1982-83 (London: International Institute for Strategic Studies, 1982), 131.

Shortfalls in yearly spending by these major countries represent a significant deficiency in levels of armed forces and equipment. Countries depicted have one thing in common: They are all tied to the United States through defense treaties. These treaties bind the United States to some level of support in case of attack. To what extent the United States is obligated to support these nations with military equipment is not defined. But during World War II and the Korean War, and after the Yom Kippur War, the United States responded to requests from Allied Nations for equipment. The same strategic assumption must be made today as was made in the World War II Victory Plan: American materiel must be deployed to US Allies.[14]

The United States has the Free World's largest armament industry and greatest industrial potential, which were displayed as the "Arsenal of Democracy" during World War II. Demands for equipment will come at the point when the Free World perceives the threat to be sufficient to reevaluate national priorities and spend more for defense. Mobilization of US forces, in all likelihood, will generate a global mobilization of the Free World which, in turn, will cause a huge initial demand for US defense products.

The combat effectiveness of any armed force may be heightened by increasing its responsiveness and mobility. Countries on the Pacific Rim, including those in North America, are absolutely dependent on sea lanes of communication for their existence. The Soviet Navy has the capability of interdicting these sea lines.[15]

Japan, in particular, sees the need for ASW helicopters.[16] Prime Minister Yasuhiro Nakasone, in fact, has announced the following objectives:

- To have complete control of the four straits near the Japanese Islands.

- To limit the Soviet Navy's surface and subsurface activities.
- To secure and maintain the ocean lines of communication between Guam and Tokyo and between the Strait of Taiwan and Osaka.[16]

To help attain these objectives, Japan has ordered two SH-60B Seahawks for evaluation as its ASW helicopter.[17]

Like Japan, Australia and New Zealand are dependent on the sea for their economic well-being. Australia sees its commitment to the ANZUS Pact as imposing the obligation to provide for its own defense. In addition to the practical peacetime benefits of the Alliance to both countries, Australia recognizes that the defense relationship with the United States gives substantial grounds for confidence that in the event of a fundamental threat to Australia's security, US military support would be forthcoming.[18]

The number of H-60s needed by these Pacific nations is difficult to determine, but a definite shortage of these weapon systems exists. At the escalation of world hostilities, the demand will be immediate. Vital to our own security is the support of equipment needs of countries that will, in turn, support our objective of defeating Soviet aggression. Because our high-technology weapon systems are the best in the world, our Allies will want and expect nothing less. Given the capabilities of the SH-60B Seahawk, it will be on the top of the want list of those nations threatened from the sea.

Demands of Combat

Following the provisioning of US Allies, H-60s will be in great demand for replacing combat losses.

Many scenarios and simulations indicate the likelihood of high combat losses. Loss rates for helicopters during the Yom Kippur War, the Falklands conflict, and Grenada, for example, and Soviet losses in Afghanistan, indicate that attrition in ground combat will be high. The Royal Navy lost more than 20 helicopters during flight operations in the short war in the Falkland Islands.[19]

Attrition rates for UH-60s engaged in ground combat operations in a conventional war in Central Europe probably will be in excess of 60 per month. Projecting from the Falklands battles, operational losses for extended ASW operations in the North Atlantic and Indian oceans and the Mediterranean Sea will exceed 10 per month. The US Air Force will have significant losses of HH-60D helicopters, because the SAR mission is particularly dangerous; HH-60D losses also will exceed 10 per month. These attrition figures represent approximately 7 percent of the initial aircraft engaged in combat operations, plus noncombat losses for the total fleet. This attrition rate is very conservative, but it serves to illustrate the problem.

Combat losses are not the only cause of aircraft nonavailability.

Normal maintenance and repair of these high-technology machines add significantly to their nonavailability. Peacetime flying rates drive the need for repair parts; the Army will purchase enough parts to keep 75 percent of the fleet in the air if each aircraft flies approximately 14-20 hours per month. Wartime flying hours are considered to be a minimum of 76 hours a month.[20]

At Fort Lewis, Washington, testing of the Army's first divisional aviation brigade was at a rate of 180 hours per aircraft a month. It represents a

major increase in peacetime flying rates and significantly will increase the flying hour-based demand for repair parts. Demand for H-60 helicopters will start as the level of hostilities reaches the point where all nations become alarmed. US Allies, many without a defense industrial base, will need to upgrade their military forces. They logically will turn to the most powerful Free-World force with requests to buy high-technology weapon systems. Increased operations and combat losses will result in high demands for spare parts and additional H-60s.

2.
Initial Wartime Supply

In a Central European conflict, the helicopter shortage resulting from the diversion of Black Hawks to US Allies would be only one example of equipment deficiencies that will reduce conventional combat capabilities of the US Army. Undoubtedly, other key items of equipment would be diverted. Decisions to deny the Army some of its primary weapons would be necessary and correct for the overall war effort. Shortages, and the fact that demands could not be filled quickly, would be caused by decisions made in response to other national priorities during the preceding 30 years[1] -- decisions that were neither necessary nor correct.

Shortfalls in equipment needed to sustain combat operations would be predictable, for the United States had deliberately allowed its industrial base to decline. A weak defense industrial base ensured that US Armed Forces would not be able to contain a major thrust by Warsaw Pact countries.

On 29 December 1980, the US Congress recognized the seriousness of problems with the defense industry base. That was the day when Rep. Richard H. Ichord (D-Mo.) presented the report of the Defense Industrial Base Panel of the House Committee on Armed Services for the 96th Congress. In his letter of transmittal, Ichord wrote,

> The panel finds that there has been a serious decline in the nation's defense industrial capability

> that places our national security in jeopardy. An alarming erosion of critical industrial elements, coupled with a mushrooming dependence on foreign sources for critical materials, is endangering our defense posture at its very foundation.[20]

How far has the industrial base declined?

To the point where recovery is going to be expensive, and long in coming. Loren Thompson, a consultant to Congress on national security affairs, adds the following emphasis to the long-term nature of the problem of the declining US industrial base:

> The inauguration of President Ronald Reagan presages a period of substantially increased defense spending. Within both the new administration and the new Congress there is widespread agreement that the erosion of American military strength must be halted, and that means much larger defense budgets. However, many proponents of increased defense spending erroneously assume that the American economy is able to convert substantially more defense dollars into substantially more defense with little difficulty. In fact, the ability of US industry to expand defense production significantly any time soon is very much in doubt, and the reasons why are not hard to identify.[21]

These defense industrial base problems are directly attacking the primary source of US military strength, according to *United States Military Posture for FY 1983*. Any major confrontation with the Soviet Union, the report states,

> would place extraordinary demands on war materiel critical to sustaining US force. A strong industrial base, capable of rapid expansion, is therefore critical to both deterrence and defense....

> Over the years, there has been little improvement in the capability of the defense industrial base to respond to potential wartime requirements ... new directions proposed by DOD will take several years to implement, but if vigorously pursued should result in a surge capability for related combat essential materiel and an enhanced US sustaining capability.[24]

The United States is not prepared for conventional war simply because it cannot sustain its forces,[25] nor replace equipment within any prudent time frame--equipment that predictably will be lost on the battlefield, along with the operational capability it affords.

Specifically, Black Hawk helicopters will not be available in Europe to replace losses; industry cannot produce additional airframes fast enough to cover those losses. This lack of production capability will be an additional difficulty for the commander already burdened by a shortage of other critical items.[26]

Most equipment used in training for combat will be in short supply after the first weeks of combat. The central issue here is whether the rate of production meets the need to sustain combat operations.[27]

Without doubt, the United States eventually can outproduce any potential adversary. Time becomes the primary factor--time to recognize the threat, time for the Government to contract for more defense items; time for contractors to let contracts; time for subcontractors to set up and manufacture components for the prime contractor; and time to produce the weapon systems.

Given ample time for all these process delays before the first day of hostilities, the US economy

would be able to supply US needs, as well as the needs of US Allies.

The shortfall in H-60s is shown in figure 2. By starting combat operations with only sufficient helicopters to equip the forces in being at that time, attrition guarantees shortfalls until years later, when US industry can overcome the losses due to combat. The graphics demonstrate both the immediate problem and the eventual solution. The shortfall for the commander in Europe will exist if inventories on

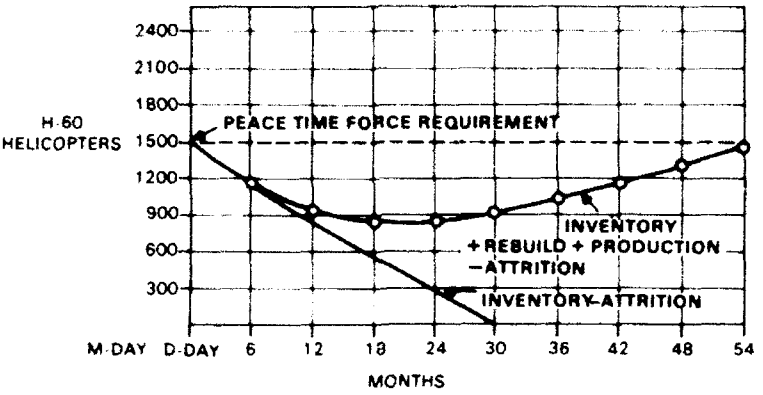


Figure 2. UH-60 inventory production and attrition

Notes:

1. Adapted for UH-60s from a Joint Department of Defense-Office of Management and Budget Aircraft Industry Capacity Study of January 1977.

2. Level at peacetime assumes planned procurement is complete.

3. M-day is the day of mobilization and the day the President authorizes additional production, and was assumed to have been declared six months prior to start of hostilities.

4. Rebuilding of damaged aircraft will be critically important to the sustainment effort.

hand at the beginning of the war are not sufficient; and insufficient inventories will exist when peacetime requirements are less than wartime needs. DOD procurement plans that should include realistic approximations of the total needs of combat (to include the requirements of Allies), but in fact provide only what is needed to fill peacetime force level needs of the US Armed Forces, guarantee that the commander will fight without sufficient aircraft, once attrition begins. Combat consumables, such as ammunition, have long been planned for, using a method that calculates inventories needed to cover the demand required from the onset of hostilities (D-day) to the time that production can meet combat expenditures (P-day).

Although not directly applicable to complete helicopter inventories, this D-day to P-day planning concept (figure 3) does emphasize front-end

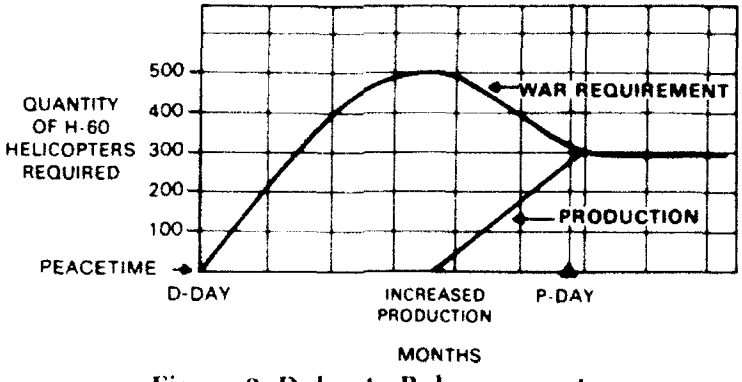


Figure 3. D-day to P-day concept

Notes:
1. P-day is the day production meets the needs of sustained combat.
2. The curve of the wartime requirements line is historically derived and shows the initial build-up of intense combat followed by some drop-off in attrition to a steady state level.

requirements for sufficient inventories to cover initial losses. As published in the May 1981 *Comptroller General Report to the Congress*,[5] the D-day to P-day concept shows the difference in peacetime and wartime requirements. To sustain any force in war, all classes of supplies must be available to replace losses.

Unlike the D-day to P-day view, H-60 helicopter production is geared to produce quantities to fill the needs of current force levels.

Production Rates of H-60 Helicopters

The H-60 totals are based on needs of US forces to meet current force requirements. Production rates vary from 4 to 15 per month, and production will end in the early 1990s.

Programmed production of H-60 helicopters for the 1980s and into the 1990s is designed to fill anticipated requirements. If war breaks out before the end of production, production rates may have to be increased to accelerate the initial force-fill and to replace combat losses. If war breaks out after the initial contracted buy, production must be restarted to cover combat losses. Any additional helicopters required to fill the needs of other than the current US force structure will require even greater production rates.

How responsive the manufacturing system is to the needs of the nation's defense is the central issue of conventional warfare sustainability. Considerable evidence exists that industry will not be responsive. Manufacturing weapon systems is a lengthy process. The speed at which the prime contractor and his suppliers can increase the rate of production is limited by the complexity of the systems, materials

used, special tooling required to work the material, and the high level of skills demanded of the work force.

Dr. Jacques S. Gansler, vice president of The Analytic Sciences Corporation in Washington, DC, notes in his comprehensive study, *The Defense Industry*, that American industry simply cannot quickly meet the materiel needs of combat. Gansler, a former Deputy Assistant Secretary of Defense for Materiel Acquisition, writes,

> The industrial base of US defense is becoming both economically inefficient in the production of defense materiel and strategically unresponsive in terms of the production speedup required to meet an emergency.[29]

Problems of the industrial base are many and have become apparent in both the public and private sectors.

Priorities and Planning for Sustaining the Force

Responsibility for maintaining a ready and responsive defense industry clearly rests with the Department of Defense (DOD).[30]

Unfortunately, the Defense Department has failed to ensure industrial preparedness. The free enterprise system does not deliberately produce products it cannot sell, nor does it maintain in reserve a nonproductive expansion capability in case the national government decides to accelerate production. Industrial responsiveness must be paid for; the United States failed to buy responsiveness and bought, instead, the "short-war" assumption[31] that

emphasized forces in being and reflected little concern for the industrial base. The decline from a fully mobilized nation to one with extremely limited mobilization potential occured over a 30-year period.

As the overwhelmingly major holder of nuclear weapons in the 1950s, the United States knew that it had to have an alternative to the singular nuclear response to aggression. It therefore maintained relatively large standing conventional forces and funded industrial facilities to support any war effort. During the Korean War, the US Armed Forces were served by remaining World War II facilities; with the exception of certain types of ammunition, the industrial base was sufficient.

In the 1960s, the intensity of the Vietnam War increased, materiel was supplied essentially on a business-as-usual, lowest-cost basis. The slow build-up in Southeast Asia did not require a surge to meet needs. As the war progressed, without a declared emergency, contracts were let with regard only to price, often to unqualified bidders. Many qualified and designated "planned mobilization producers," who had made previous agreements with the Government for war production, were ignored.[42]

The planning effort that the defense industry had expended under existing mobilization regulations did not count in the competition for contracts during the Vietnam War. The lack of a connection between predesignated mobilization suppliers and companies that obtained contracts ensured an industry-wide avoidance of that program. After the Vietnam War, conflicting national priorities led to a further reduction in concern for the industrial base. Decisions made on price, while often economically sound, were the cause, in part, of the final demise

of the defense industrial base. Some industries went to where the money is—the commercial market. The decline of American industry continued through the 1970s largely because of the DOD's lack of financing of industrial preparedness, and reliance on the assumption that any war to be fought would be short and industrial mobilization would not be needed.[33]

The short-war concept assumes away any problem with industrial preparedness. Funds need not be spent on preparedness for a war that is so violent, and with attrition rates so high, that battles last only a few weeks. Such a war is far too short to require a national mobilization. To further ensure that funds are not allocated for the industrial base, the short war is assumed to start without sufficient warning to allow any production increase. The short war will be fought with the "force in being" and with whatever stockpiles of materials are available.

This short-war assumption in planning has had a significant impact on funding the defense industrial base. Most directly affected by this scenario are criteria for estimating the size of the country's industrial base.

Industrial base-sizing is the single most important factor in determining the size of production facilities for new weapon systems being acquired, as well as funding maintenance and modernization of facilities producing equipment under existing programs. Defense guidance steadily eroded the industrial base size from that required for total mobilization in 1977, to that required to support wartime requirements by 1979. This aspect of defense guidance finally reduced base-sizing criteria in 1980 to a level required to support peacetime

requirements, with the added emphasis that this peacetime production would be at the most economic production rate.

The steady reduction in the size of the industrial base ensures little or no industrial surge or quick start-up to meet the demands of war; it plans for production that is going double shift simply to fulfill peacetime contracts. Problems associated with an undersized industrial base have been recognized, and addressed in recent defense guidance.[34]

As conceived, this DOD policy of funding only the most cost-effective production lines does save money in the short run, but it also is very shortsighted. One of the easiest methods of ensuring some sort of measurable surge capability for any active production line, and a method used for years in Government contracts, is to plan on the addition of second and third work shifts as part of that surge capability. Simply hiring more people to work in a factory, however, is not necessarily the complete solution to increasing production; the largest problem lies with the ability of subcontractors to provide components and materials.

Without committed and planned subcontractor effort, surge capability is not possible. Many governmental agencies concerned with a responsive defense industrial base have identified other major problems with that base. These problems stem primarily from faulty planning under the DOD Industrial Planning Program (IPP). These faults include the following:[35]

- Unrealistic assumptions about availability of materials, facilities, and equipment.
- Little or no information on second- or third-tier subcontractor capabilities.

- No identification of funding for industrial preparedness measures.
- Problems associated with mobilization being assumed away.

Problems with Subcontractors

Supporting any major defense contractor are hundreds of individual companies under subcontracts to manufacture parts and components or supply materiel to the prime contractor. The sophisticated H-60 helicopter series is made up of hundreds of thousands of component parts; these parts are manufactured in production facilities that respond to real-world problems of manufacturing, as does the prime contractor.

Problems with manpower, materials, facilities, tools, and other supplies are magnified throughout the industry. The overall effect is a large delay in response time. However, production delays due to subcontractor shortcomings generally are not the most serious problem.

Problems with Suppliers

Very few delays in the industry can exceed the delay of metal fabrication. Even if the Sikorsky Aviation Company has the necessary people, facilities, and tooling in place, it must wait up to 46 weeks for aluminum extrusions, 115 weeks for large titanium forgings, and 36 weeks for titanium sheet and plate.[36]

These lead times have increased considerably for many reasons. The Federal Government's uncoordinated efforts at times create greater problems.

For example, Federal pollution standards and certain wilderness preservation programs have devastated the metal industry. The fact that forging manufacturers use large hammers, causing noise and vibration levels exceeding standards of the Occupational Safety and Health Agency (OSHA), has caused a portion of the forging industry to leave the business or move out of the country to be competitive in price.[87]

Acquiring forgings necessary for production has become increasingly more difficult for prime defense contractors. Solicitations for forgings often are for small quantities of special items. As many as 40 percent of forgings suppliers do not bother to respond to Government-related requests.[88]

The result is significantly increased lead times, often from foreign sources, that almost doubled during 1976-80. An example is a titanium bolt: In 1976, 32 weeks were required for delivery; in 1980, delivery took 62 weeks. In 1985, 26 weeks delivery time was required even in a period of limited demand. The lead time required for basic components and parts has become the most significant factor in the decrease in responsiveness of US industry.

As an additional note, despite recent corrective legislation, the US Government often does not pay its bills on time, which can mean the difference between life and death for small contractors who supply vital materials. The interest on money borrowed by the small contractors to cover the month-and-a-half delay in payments often means that they do not survive or, at least, are not interested in future Government business.

American industry responds to profit and loss as the economic system dictates. To be successful in the defense industry, a company must produce efficiently those items specified in a contract. The

ability to rapidly surge production is based on having materials, facilities, and manpower readily accessible. Pre-stockage of items necessary for production is costly but necessary for surge. In this case, cost savings also directly limit surge capabilities. Because long lead times are required for critical H-60 helicopter components, any increase in production must be delayed by these lead times. Limits exist to what a contractor can do, even if lead times for necessary supplies were reduced; these limits include the availability of facilities, special tooling, and skilled manpower.

3.
Solving the Problem

BECAUSE OF ITS PROCUREMENT POLICIES, the United States—the strongest economic power on earth—is destined to field a military force that cannot rely on the bulk of its potential economic and industrial strength. The United States has provided sophisticated weapon systems, but has neglected to ensure that resupply will be available throughout a conventional war. The country's inability to sustain the force will ensure a reduction in combat effectiveness—a reduction it can ill afford.

If we are to win, the best possible weapons must be available for the duration of the conflict.

A system that currently may not be sustainable in combat is the H-60 helicopter. Some methods are possible, however, for increasing the availability of this aircraft during an extended conflict. Interaction of low initial inventories, and a slow response of the production base of the H-60, are causes of the problem of short supply. With an already short supply, demand increases are manifested in wartime needs of US Allies and in our own attrition from combat.

Thus the solutions suggested here are designed to increase initial inventories and to shorten the time required for industry to increase production.

Solutions cannot directly address the problems associated with US Allies, as the problem is ill-defined and shortfalls are potentially huge. Putting

our own house in order and acknowledging our obligations to our Allies will, at least, start the process of preparing for a possible extended global conflict.

Increase Surge Capability

Preparation for sustained combat requires a combination of standing forces and industrial readiness. Industrial readiness always will be linked to the health of the US industrial base. To enhance the short-term capability of the United States to sustain its forces, the defense industry should be funded to purchase complete sets of long-lead-time components, before these components actually will be used in the assembly of critical weapons, in this case H-60 helicopters.[9]

Initially requiring up-front money, this procedure represents a purchase early in the production run of all long-lead-time components, to be used later in the manufacturing process, and provides significant cost savings through the purchase of economical lots. This stockpile of components will ensure that while the production line is operating at low rates it can at least surge to produce already-contracted-for aircraft.

Additionally, as long as H-60s are in the military force structure, additional inventories of long-lead-time items should be purchased and maintained, to ensure a planned rapid-expansion capability, even if initial production has ceased. Eventually, these components would be used as repair parts, as the future replacement for the H-60 is phased into the US Armed Forces. Benefiting from this early buy would be the subcontractors, who could get orders in sizable quantities to set up

efficient production of larger orders and take advantage of the opportunity to increase profit without increases in cost to the Government.

Increased opportunity for profit will invite more competition and reduce the no-bid level on subcontracted items. Given the cyclic nature of the aerospace business in the 1970s and 1980s, planned early buys during times of slack commercial business would strengthen the industry. Along with the early purchase of long-lead-time components, the additional expense of not using the most economically efficient peacetime production schemes also must be accepted, and business must return to the concept of the single work shift for manufacturing.

This move will permit regaining the inherent surge capability available in allowing for the addition of manpower to operate existing tooling and production facilities, to increase production rates in times of emergency. This surge capability, coupled with available long-lead-time components, would provide a rapid increase in production rates. Planning for wartime production within the total helicopter industry also must include international production facilities.

If the capability to manufacture components for the H-60 exists, we should plan to use it. We should know the specific capability and, if possible, let premobilization contracts. If certain portions of the US industrial base have gone overseas, particularly if foundries have found business conditions better in the Far East, the use of these facilities must be coordinated, as long as we are deficient. The use of allied facilities in the case of mobilization will require government-to-government cooperation and planning. Reduction of leadtime bottlenecks to

production, especially for small air-transportable forgings, would greatly increase surge capabilities.

Increase Inventories

A time lag always will exist in surging production lines; therefore, the United States must have sufficient aircraft on hand to cover this interval. Providing additional aircraft to units is a method derived from the D-day to P-day concept designed to offset initial combat loses. Without additional aircraft, committed combat forces cannot be sustained. Any method that provides additional resources to field commanders contributes significantly to solving the problem of certain H-60 shortfalls after the first days of war.

Using substitute aircraft is an excellent method of adding to existing inventories.[10] Adding more H-60s to inventories is the best method, but it may not be affordable. To be effective, substitution must be done now to give commanders the needed confidence in working with substitute aircraft.

Crews, maintenance personnel, and supply systems should be combat-ready and in place to support the surrogate. The middle of the war is not the time to introduce a substitute for the H-60; any aircraft used in combat also must be part of the training for combat. Given the alternative to substitution—that is, to do without—the idea of designating an aircraft to be issued in lieu of the H-60 has merit.

Now is the time to substitute aircraft, and the aircraft should be the one that the H-60 is to augment or replace.

For the Army, it would be the UH-1H; for the Navy, it would be the SF-2 or HH-3; and for the Air Force, it would be the HH-3. These other aircraft are fully capable of performing a portion of the mission, although not with the lift performance or speed of the H-60. Fortunately, not all missions require all the performance of the H-60; the substitute could relieve the H-60 of all but the most demanding missions.

The Army requires a utility helicopter that is basically a good-weather vehicle for lifting troops and supplies. This mission has been performed by the UH-1H for years, although not to the degree and speed of the UH-60, and without its special survivalibility. Because of the increased lift performance of the Black Hawk, fewer UH-60As are required to perform the unit mission that had been performed by the UH-1H.

Essentially, the total mission to lift the assault elements of an infantry company in a single lift was given to 15 UH-60As, as opposed to 23 UH-1Hs. Frontloading the combat aviation companies of Army units allows them to perform their assigned mission longer, so each company should retain an additional 20 percent UH-60A equivalent over its current full combat authorization. In the case of a combat aviation battalion's lift company, five additional UH-1Hs would give the unit sustaining capability. Costs, however, are associated with this procedure, such as additional unit-level complexity and operational equipment incompatabilities of speed, load, and operating envelope.

But similar-size units, with more complex maintenance and operational loads, are found in the divisional cavalry squadron. Because UH-1Hs will

be assigned to the aviation battalion, these additional aircraft should give little maintenance problems at that level. The 20 percent increase should be applied to all combat and medical evacuation units. Authorization must be done now, to ensure that operations, maintenance, and supply personnel and systems have the benefit of training for combat.

Owing to shipboard constraints and the dispersion of SH-60Bs in small numbers throughout the fleet, the addition of SH-3s on board aircraft carriers and destroyers may not be feasible. The Navy should retain the 20 percent SH-60 equivalents on shore and deploy these aircraft regularly. As with the Army, the additional complexities in training and maintenance inherent in using other types of aircraft will not overcome the benefits of having an aircraft to do the ASW mission. To provide a degree of combat sustainment, the Air Force also should be authorized an additional 20 percent of HH-60D substitutes.

US Allies also must be equipped for combat, and, if their needs become known, older but still capable aircraft should be provided to fill their immediate requirements. US policy decisions on fulfilling allied demands should be made early, to allow them to know the types of equipment they will receive. Foreign military sales, co-production, or total production overseas should be encouraged, to help US Allies build their prewar inventories. Any shortfall, US or allied, will degrade the total global war effort.

A program similar to the US Air Force Civil Reserve Aircraft Fleet (CRAF) Program should be initiated. The CRAF Program essentially pays for modifying civilian carrier aircraft, to allow easy conversion to military use as cargo aircraft in the

event of a national emergency. The Air Force also pays for the cost of operating the modified aircraft at the additional weight. This cooperative effort between public and private sectors is designed to provide the Air Force with a readily available airlift asset.[41]

The lack of success of the CRAF program—few aircraft have been modified—does not detract from the concept. Following the Soviet example, the design of future aircraft should include civilian and military market considerations. Applying the CRAF concept to the UH-60 program would pay great dividends, in terms of existing UH-60 inventories at the beginning of a war. On one hand, Nighthawks and Seahawks are too complex to be easily converted from a stripped-down civilian model to their mission configuration.

On the other hand, the Army's Black Hawk has much in common with a civilian aircraft. The UH-60A, of course, does have purely military components that would not be necessary for a civilian operator. Armor plating, ballistic tolerant control tubes, and redundant sub-systems are not necessarily high on a civilian operator's list of desirable features. But the superior performance of the aircraft at high altitudes, and its speed, excellent internal and external lift capabilities, and wide cargo area have civilian application.

The Civil Reserve Helicopter Fleet (CRHF) Program should pay for the difference between the civilian and military versions of the Black Hawk. The CRHF Program also should allow the sale of civilian aircraft to US commercial operators who, under the powers of the President after declaring a national emergency, would make the aircraft available to the Army. The reconversion of the aircraft for military

service would require minimum effort, if necessary components for conversion were set aside.

Benefits from such programs go beyond the availability of additional aircraft and extend into logistical support for the whole aircraft fleet. A civilian operator flying an expensive helicopter must fly a great number of hours to get a reasonable return on his investment. The commercial operation usually logs up to 10 times more yearly flight hours than the Army. This acceleration of flying adds greatly to the reliability, availability, and maintainability (RAM) data on the aircraft. RAM data will allow the Armed Services to better plan their wartime maintenance programs. More flying hours generate a greater demand for parts, which, in turn, are manufactured and stocked. Requests for parts provide additional data that can be used to make important decisions about repair-parts stock levels.[42]

The cost of the CRHF Program is high. But it appears to be an ideal way to have the private sector subsidize the DOD war reserve, and help increase overall force readiness.

Increase Readiness

Availability of parts and an efficient maintenance operation translate directly into additional mission-ready aircraft. For the commander, mission accomplishment is what ultimately matters. A mission not completed—whether it be for lack of maintenance, or shortage of parts—is still a mission not accomplished. Thus, the existing maintenance system must be made more efficient, particularly in the area of availability of repair parts, and maintenance evacuation of helicopters. Repair parts become

available as demand histories are built up, and parts are stocked to the levels necessary to meet future needs.

Establishing a sound base on which to make repair parts stocking decisions requires data reflecting parts needed for extended flying hours. Parts information generated from extended flight operations under the CRHF Program will benefit the information base, but only to the degree that the size of the CRHF fleet and the missions flown approximate the entire H-60 population. Military flying hours must be increased, to increase the repair parts data base.[43]

Without a great deal of flying over an extended period, the United States will have a peacetime parts supply in a wartime situation. Thus, the military flying-hour program should at least double. Along with increased demand for parts, stored parts must become more visible to all maintenance levels.

Currently, the Army authorizes the lowest aviation company level to stock parts if demand warrants stockage and the company is authorized to do the work. Efforts must be made to increase the availability of parts by increasing the level of awareness as to which unit has which part. The information currently is available; but no procedures exist for rapidly exchanging parts information across unit lines. The use of computers for inventory control and data links between Service maintenance units and commands will increase the efficiency of the parts system; this system also will result in an increase of aircraft available for missions.

Some components are tracked from the factory to the unit because of their high cost; the information system described here would provide a like visibility to parts stored at the unit level, thereby increasing parts usage and operational readiness.

Force sustainment can be greatly enhanced by increasing the efficiency of the military repair-and-rebuild system.[44]

One of the largest sources of repair parts and components is the aircraft in the fleet. Controlled substitution of repair parts and components from one aircraft to another is a time-honored method of increasing operational readiness of weapons. Damaged aircraft must be included in the substitution scheme; helicopters are rarely a total loss, but often are damaged to the point that they no longer are combat ready. To increase the efficiency of the repair-and-rebuild system, a method of assessing the degree of damage to a helicopter and its critical parts should be implemented. After damage assessment, the parts inventory control system would be used to help decide what to do with the aircraft. Critical parts that are determined to be airworthy would be transported to unit rebuild facilities or the industrial plant needing the parts to complete its work.

Close parts control, repair-and-rebuild coordination, and damage assessment will require a relook at positioning and manning of maintenance units. Essential elements currently in the force structure potentially can make the greatest contribution to combat sustainability. Results of calculations for determining combat loss and resupply are shown in figure 4. As indicated, a large increase in initial inventories, combined with an increase in maintenance capability and reduced industrial response time, can make a significant difference in the ability of the United States to sustain combat operations. Even with the incorporation of recommendations, several shortages are noted if demands of Allies are included.

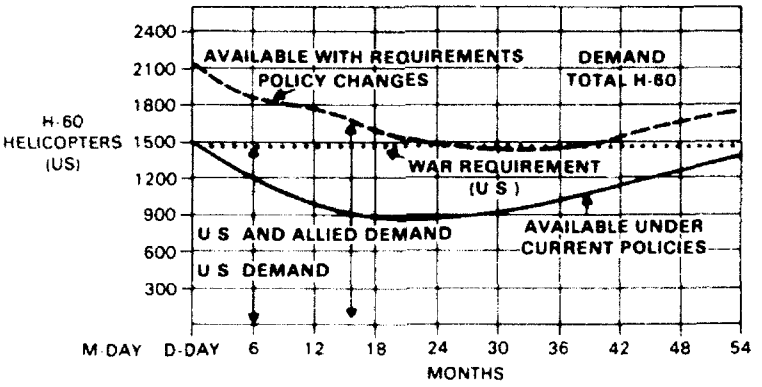


Figure 4. H-60 supply and demand

Notes:
1. Even with a civilian reserve helicopter fleet (CRHF) of 250 units, and an additional 20 percent increase in H-60 equivalent helicopters, an additional industrial surge would be necessary to allow production of 10 units per month at M-day plus 6 months.
2. Factors used in the simplified attrition model were estimated by the author of this essay to illustrate the relative nature of the problem and the impact of suggested solutions.

Efforts to recover from the short-sighted view of conventional war will be expensive, but they will result in a commitment to sustained combat operations. In a short war of high attrition, the Soviets have the advantage because their equipment is on hand.[45]

Solutions provided for the H-60 series of helicopters will narrow the gap between wartime requirements and peacetime production for this particular equipment. Surely, similar principles apply more generally to the whole matter of improving sustainability by increasing surge capability, building up inventories, and sharpening readiness.

Endnotes

Preface

1. John J. Fialka, "Grim Lessons of Nifty Nugget," *Army*, April 1980, p. 15.

2. *Hearings Before a Subcommittee of the Committee on Appropriations, House of Representatives, Part 1* (Washington, DC: US Government Printing Office, 1984), p. 83.

Scenario

3. The importance of sophisticated high-technology helicopters in detecting, tracking, and destroying submarines is discussed in *The Air and Sea Lanes of the North Atlantic: Their Security in the 1980s* by Sherwood Cordier (Lanham, Md.: University Press of America, 1981).

4. "Exclusive AFJ Interview with Admiral William S. Crowe, Jr., Commander in Chief, US Pacific Command," Deborah G. Meyer, senior editor, *Armed Forces Journal International*, May 1985, p. 106.

5. Since 1960, the United States has had mutual cooperation and security treaties with Japan.

6. *A Report to the Committee on Appropriations, US House of Representatives, on Readiness of the US Military - U.S. Army, Vol. 1, March 1983.* This document describes the then unsatisfactory Army readiness as follows:

> One of the Army's biggest spare parts problems has developed with the UH-60A Black Hawk helicopter. The Spares Shortage List, which contained 10 items in 1981, reached 24 (items) by April 1982. According to Army officials, the Black Hawk could only be maintained on deployment by controlled substitution of parts or 'cannabalization.'

Chapter 1

7. "Military Balance," *Defense Helicopter World*, Vol 4, No. 1, March-May 1985, p. 131.
8. "Navy Stressing Survival of Fleet in Nuclear War," *Aviation Week and Space Technology*, 8 March 1982, p. 51.

9. "'83 Flight Test Set for Rescue Chopper," *Army Times*, 1 November 1982, p. 27.

10. Requirements for operational units, training base, and maintenance differ in each Service, but are specified in requirements documents.

11. Since 1976, Japan has limited its defense expenditures to under 1 percent; the figure of 1.6 percent is derived by using the same general accounting criteria for Japan that are used for NATO countries. NATO includes such items as military pensions as part of the defense budget.

12. Alan S. Milward, *War, Economy, and Society 1939-1945* (Berkeley: University of California Press, 1977), p. 47. The percentage increases in armaments expenditures in certain countries during the period 1934-38 ranged from 47 percent for Hungary to 470 percent for Germany.

13. Ibid., pp. 51-52.

14. Japan Defense Agency, *Defense of* Japan 1981, p. 93.

15. Ibid., p. 135.

16. *The Washington Post*, 19 January 1983, pp. A1, A13.

17. *Defense Helicopter World*, March-May 1985, p. 132.

18. *Pacific Defense*, February 1981, p. 39.

19. Derek Wood and Mark Hewish, "The Falklands Conflict, Part 1: The Air War," *International Defense Review*, Vol. 15, No. 8/1982, pp. 977-80.

20. See *US Army Aviation Digest*, January 1985, pp. 38-39 for a general discussion of conclusions of the

"AVLOG 84" analysis. The Army-approved, in *AR 570-2*, wartime flying rates of 2.53 hours per day for UH-60 units are too low, and should be the rates resulting from the Army aviation mission area analysis conducted in 1984, of 6.1 hours per day. In his 11 April 1987 address to the Army Aviation Association, the Army Vice Chief of Staff, General M. R. Thurman, stated that the current operational tempo for helicopters was 16 hours per month and this tempo would be raised to 20 hours per month.

Chapter 2

21. *The Ailing Defense Industrial Base: Unready for Crisis*, report of the Defense Industrial Base Panel of the Committee on Armed Services, US Congress, House, 96th Congress, 2d session, 31 December 1980 (Washington, DC: US Government Printing Office). This committee report also contains detailed findings and recommendations concerning DOD inadequate planning and acquisition procedures, critical materials, and US tax policies that have contributed to the industrial decline.

22. Ibid., p. 1

23. Loren Thompson, "The Defense Industrial Base: Going, Going ...," *International Security Review*, Vol VI, No. II, Summer 1981, pp. 237-272.

24. *United States Military Posture for FY 1983*, prepared by the Organization of the Joint Chiefs of Staff (Washington, DC: US Government Printing Office, 1982-83), p. 53.

25. A definitive and comprehensive history of US policies and decisions concerning industrial-base preparedness for mobilization is contained in *Industrial Mobilization: The Relevant History* by Roderick L. Vawter (Washington, DC: NDU Press, 1983). Of particular interest is Vawter's conclusion that the primary lesson to be learned from past industrial mobilizations is from the US decision to mobilize in strong response to the 1950

Soviet-backed aggression in Korea, a response designed to deter further attack. Contrasting our nonresponse to recent Soviet aggression is important to understanding the ability of our conventional forces to act as a deterrent to further aggressions. See Milward, *War, Economy and Society 1939-1945*, for the impact of principal national economies on war strategies and outcomes.

26. General Alton D. Slay, USAF, in testimony before the Defense Industrial Pase Panel, underscored the inability of US industry to surge to meet needs generated by a conventional war, when he said,

> After 18 months under surge conditions, we could only expect to get an aggregate of 22 more A-10s and no additional F-15s and F-16s than already exist on currently contracted delivery schedules.

Dr. William J. Perry, then Under Secretary of Defense for Research and Engineering, also testified that we could increase by 50 percent our production of A-10s, F-15s, F-16s, XM-1s, UH-60s, frigates, and destroyers over what we currently are producing without extreme difficulty, but if we need to double production rates in three or six months, no way exists by which we can do it. Of course, the number of items in current production is the key to how many actual items of equipment will end up in the hands of troops. Current production rates are extremely low to deliberately stretch out defense procurement costs.

27. *The Ailing Defense Industrial Base*, p. 1.

28. US Comptroller General Report to the Congress, *DOD's Industrial Preparedness Program Needs National Policy to Effectively Meet Emergency Needs*, 27 May 1981, p. 15.

29. Jacques S. Gansler, *The Defense Industry* (Cambridge, Mass.: The MIT Press, 1980), p. 4. Gansler, who conducts economic and management studies for the Federal Government as vice president of The Analytic Sciences Corporation, suggests in the preface to his book that if the

correction actions he proposes—policy changes aimed at improving the future security position of the United States—were to be initiated soon.

> the Department of Defense would be able to buy well over $3 billion worth of additional equipment each year without any budgetary increases and the defense industry would be far more responsive to future demands for rapid increase in the production of military goods.

Without these changes, Dr. Gansler continues,

> America's defense problems will grow far worse: The overall defense posture will weaken seriously while defense budgets increase greatly.... It is not inconceivable that the United States will follow the path taken by Western Europe—nationalization of the defense industry—unless the undesirable economic and strategic trends are corrected soon.

30. Comptroller General's report to the Congress on Industrial Preparedness (see note 28), p. 1.

31. *Report of the Defense Science Board 1980 Summer Study Panel on Industrial Responsiveness*, January 1981, p. 21.

32. Association of the United States Army, *Army Industrial Preparedness: A Primer on What It Takes to Stay Until the War is Over*, 1979, p. 4.

33. Industrial preparedness measure is a procedure designed to shorten post M-day (Mobilization Day) lead times or increase production. A part of the industrial preparedness program is the recognized efficiencies that contractors present to the DOD for consideration for implementational funding.

34. The Secretary of Defense reported to the Congress in February 1984 on current DOD industrial base guidance. Secretary Caspar Weinberger recognized the need to "reverse the alarming decline of US industry." Defense guidance places emphasis on efficient production of the current five-year procurement program, funding surge

capacity for certain critical weapons, accelerating sustainability programs for critical items, and increased industrial preparedness planning. This emphasis, which will benefit the UH-60, as it is a selected critical item, is a step in the right direction.

35. Discussed in Dr. Norman Friedman's paper, *Surge Mobilization: The United States Versus the Soviet Union*, presented to the Sixth National Security Affairs Conference in 1979, is the "manpower" mobilization concept of the Soviet Union, characterized by high peacetime rates of production and stockpiled equipment to be manned by pretrained troops in a quick mobilization and almost instantaneous surge. The United States, on the other hand, does not maintain large stockpiles nor high current production rates, but relies instead on a superior industrial potential.

36. From the Joint Logistical Commander Conference 1979. These figures are very dependent on the level of orders placed ahead of the contractor and thus vary considerably with demand. They are considered very optimistic for wartime.

37. General Alton D. Slay, USAF, Commander of the Air Force Systems Command, testified before the Congress that

> there are currently 80 different laws administered by 20 different Federal agencies which directly or indirectly affect the domestic nonfuel industry. The complex regulatory processes, the government demand for data, and the environmental, safety, and health requirements often prevent companies from starting new operations or expanding existing capacity.

38. *Defense Science Board Report on Industrial Responsiveness*, January 1981, p. 49.

Chapter 3

39. The DOD recently designated the UH-60 as a critical weapon system that should be funded for multiyear

procurement. Funding for more than one year greatly aids the prime contractor, subcontractors, and suppliers in solving problems associated with long-lead-time items. In the case of the UH-60, multiyear procurement is for two years. The two-year time frame allows the manufacturers greater program stability, increases the immediate surge capability for items under contract, and goes a long way toward buying time to order and receive additional equipment sets for future production. While this step is in the right direction, it does not, in the author's opinion, go far enough.

40. *Army Aviation Mission Area (AAMA) Test Advisory Group Findings*, US Army Aviation Center, Fort Rucker, Alabama, 25 March 1985, p. 47. AAMA Deficiency Number 12 reads as follows:

> The absence of aircraft in war reserve stock POMCUS (prepositioning of materiel configured to unit sets) and TAA (Trade Agreements Act) force structure. One of the recommended solutions to this deficiency is to partially modernize the fleet while retaining a substantial number of aging aircraft, in order to resource requirements.

41. Tim Wrixon, "SRA-1 Shows New Capabilities for Paris Air Show," *Jane's Defence Weekly*, 6 April 1985, pp. 592-3. This article describes the mutual benefit to civilian and military customers of using an off-the-shelf version of the Gulfstream III and configuring it to military use. The Gulfstream III is a large (80 feet long with a wingspan of 78 feet) twin-turbofan executive transport; it is built by Gulfstream Aerospace, a subsidiary since August 1985 of Chrysler Corporation. The Gulfstream III is operated by a crew of two or three and has standard seating for 19 passengers; its US Air Force designation is the C-20.

42. Army Concepts Analysis Agency's *Aircraft Spare Stockage Methodology (Aircraft spare parts study)* CAA *SR 84-12* was performed in 1984 by the Department of the Army, Deputy Chief of Staff for Logistics. The principle finding of this special report was that the Army's

spares forecasting methodologies are peacetime, steady state oriented.

43. *AAMA Advisory Group Findings*, p. 73. AAMA Deficiency Number 25 states,

> Department of the Army (DA) Flying Hour Program: The current DA wartime flying hour program does not meet battlefield requirements for all types of rotary wing aircraft ... the wartime flying hour program must be increased.

44. Ibid., p. 103. AAMA Deficiency Number 25 also states,

> Aircraft Damage Repair: Corrective action included developing aircraft availability under combat conditions.

45. *Surge Mobilization: The United States Versus the Soviet Union*, pp. 149-150.

Abbreviations

A	letter designating "attack" type of aircraft in US military terminology
AAMA	Army Aviation Mission Area
AR	Army Regulation
ASW	antisubmarine warfare
AVLOG	*Aviation Logistics*
CAA	US Army's Concepts Analysis Agency
CRAF	Civil Reserve Aircraft Fleet
CRHF	Civil Reserve Helicopter Fleet
D-day	day marking the onset of hostilities
DA	Department of the Army
DOD	Department of Defense
F	letter designating "fighter" type of aircraft in US military terminology
GNP	gross national product
H	letter designating "helicopter" type of aircraft (when the second letter or only letter) in US military terminology
H	letter designating "search rescue" type of aircraft (when first letter of a pair) in US military terminology
HH	letters designating US Navy rotary-wing air-sea-rescue aircraft
IPP	Industrial Planning Program
LAMPS	Light Airborne Multipurpose System
M-day	mobilization day

NATO	North Atlantic Treaty Organization
OSHA	Occupational Safety and Health Administration
P-day	day when production can meet combat expenditures
POMCUS	prepositioning of materiel configured to unit sets
RAM	reliability, availability, and maintainability
ROK	Republic of Korea
SAR	search and rescue
SH	letters designating "search helicopter"
TAA	Trade Agreements Act
UH	letters designating "utility helicopter"
XM	letters designating "experimental military aircraft"

The Author

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CHOPPERS GROUNDED
The Supply-Demand Problem

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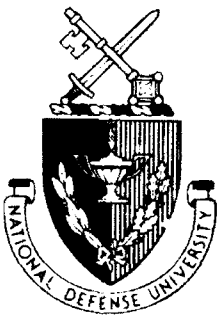
Three UH-60A Black Hawk helicopters enroute to Florida, after their acceptance ceremony at the Sikorsky Aircraft Company plant in Stratford, Connecticut. The choppers were assigned to the 55th Aerospace Rescue and Recovery Squadron (55th ARRS) at Eglin Air Force Base, Fla.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